

<p align="center">LLNL Environmental Restoration Division Standard Operating Procedure</p>	<p align="center">TITLE: Site 300 Treatment and Disposal of Well Development and Well Purge Fluids</p>
<p>APPROVAL _____ Date _____</p> <p>Environmental Chemistry and Biology Group Leader</p>	<p align="center">PREPARERS: T. Carlsen and S. Gregory</p> <p align="center">REVIEWERS: R. Brown*, E. Christofferson*, V. Dibley, B. Failor*, C. Garcia*, J. Greci, S. Mathews*, D. Ramsey*, and B. Ward*</p>
<p>APPROVAL _____ Date _____</p> <p>Division Leader</p> <p>CONCURRENCE _____ Date _____</p> <p>QA Implementation Coordinator</p>	<p align="center">PROCEDURE NUMBER: ERD SOP-4.7B</p> <p align="center">REVISION: 2</p> <p align="center">EFFECTIVE DATE: December 1, 1995</p> <p align="center">Page 1 of 10</p>

1.0 PURPOSE

To ensure that investigation-derived ground water which is purged from monitor wells is properly treated and disposed of in a manner consistent with the protection of human health and the environment.

2.0 APPLICABILITY

This SOP was developed using the guidance provided by the U.S. Environmental Protection Agency (EPA) in *Guide to Management of Investigation-Derived Wastes* (EPA, 1991). This guidance states that “the management of investigation-derived wastes (IDW) must ensure protection of human health and the environment and comply with certain regulatory requirements that are applicable or relevant and appropriate (ARAR).” The guidance further states that “as a general rule, it will be necessary to use best professional judgment, in light of the site-specific conditions, to determine whether an option is protective of human health and the environment.” The following SOP reflects LLNL Site 300’s evaluation of ARARs and its best professional judgment concerning the management of investigation-derived ground water. This procedure is applicable to the treatment and disposal of purged ground water produced by well development, aquifer testing, or ground water sampling activities at Site 300. SOP 4.7A describes similar requirements for the LLNL Livermore Site.

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3.0 REFERENCES

- 3.1 Site 300 Site Safety Plan.
- 3.2 Operational Safety Procedures (OSPs).
- 3.3 LLNL Health & Safety Manual.
- 3.4 U.S. Environmental Protection Agency (1987), *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001.
- 3.5 Crow, N. B. and A. L. Lamarre (1990), *Remedial Investigation of the High Explosives (HE) Process Area, LLNL Site 300*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCID-21920).
- 3.6 U.S. EPA (1991), *Guide to Management of Investigation-Derived Wastes*, U.S. EPA, Office of Solid Waste and Emergency Response, Publication 9345.3-03FS, October 1991.
- 3.7 Title 26, California Code of Regulations, Section 22-66699.

4.0 DEFINITIONS

4.1 Applicable or Relevant and Appropriate Requirements (ARARs)

ARARs are legally applicable or relevant and appropriate requirements, as used in the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

4.2 Investigation-Derived Wastes (IDW)

For the purpose of this procedure, IDW is purged ground water produced by well development, aquifer testing, or ground water sampling activities. They may also be drill cuttings, core samples, and/or drilling mud which are typically produced during borehole drilling and monitor well installation during subsurface investigations.

5.0 RESPONSIBILITIES

5.1 Division Leader

The Division Leader's responsibility is to ensure that all activities performed by ERD at the Livermore Site and Site 300 are performed safely and comply with all pertinent regulations and procedures, and provide the necessary equipment and resources to accomplish the tasks described in this procedure.

5.2 Environmental Chemistry and Biology Group Leader (ECBGL)

The ECBGL's responsibilities are to ensure that the appropriate procedures are followed, and that collection and treatment criteria are set.

5.3 Environmental Engineering and Field Support Groups (EEFSG)

The EEFSGs are responsible for pumping the contaminated purge water from the drums into a portable tank and performing air stripping procedures.

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5.4 Field Personnel

The field personnel are responsible for properly and safely following all applicable procedures. The field personnel are also responsible for notifying the SC if purge water collection vessels are not at the required location, if the lids to the 55-gal drums are missing, if the vessels are not tied down and/or if the vessels are not in good condition.

5.5 Quality Control (QC) Chemist

The QC chemist is responsible for maintaining the most current Federal and State Maximum Contaminant Levels (MCLs) and State Drinking Water Action Levels (DWALs).

5.6 Sampling Coordinator (SC)

The SC's responsibilities are to ensure that purge water from wells with contaminant levels exceeding discharge limits is collected and disposed of properly. The SC's responsibilities are also to arrange the delivery of collection vessels (i.e., 55-gal drums or tankers to the well sampling location) and to note the collection requirements necessary for each monitor well on the Sampling Plan, and inform the EEFSG when purge water needs to be pumped out of collection vessels and treated.

5.7 Study Area Leaders (SAL)/Field Coordinator (FC)

The SAL/FC is responsible for estimating the contaminants likely to be present, and ensuring that there are adequate receptacles for the collection of purge water generated during well development, aquifer testing, or well sampling.

6.0 PROCEDURE

6.1 Discussion

- 6.1.1 According to the Environmental Protection Agency (EPA, 1991) the "EPA has not established a presumption for the management of aqueous liquid IDW (e.g., ground water). It is left to site managers to determine the most appropriate disposal options on a site specific basis. Managers should consider volume of IDW, contaminants present in the ground water and in the soil, and whether the water is a drinking water supply. In addition, wastes should be managed consistent with the final site remedy."
- 6.1.2 At Site 300, ARARs were evaluated in determining the procedure for managing purge water. Attachment A lists those ARARs which may be applicable to purge water generated from Site 300 investigations. Attachment A also describes LLNL Site 300 actions taken to comply with the substantive portions of each regulation, as required by EPA, 1991. In addition, guidance was in part supplied by the State of California Regional Water Quality Control Board—Central Valley Region (RWQCB) and was documented in three LLNL "Records of Communication" (telephone conversations) dated June 28, 1988; November 29, 1989; and February 7, 1990. This guidance stipulates that the volumes of purged ground water at Site 300 are so minor that a Waste Discharge Requirement (WDR) Permit is not required. Also, the EPA considers drinking water MCLs and State environmental standards for drinking water to be the most pertinent applicable

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requirements for ground water. No Federal or State water quality standards exist for HE compounds. However, discharge requirements for HE compounds were established in a National Pollutant Discharge Elimination System permit issued at another facility as discussed by Crow and Lamarre (1990). The tritium disposal criterion is set at 5% of the drinking water standard. As tritium occurs in the form of tritiated water, and thus easily moves with water, this very conservative disposal criterion assures that ERD does not increase the areal extent of tritium found at Site 300.

- 6.1.3 In developing this SOP, every effort was made to ensure compliance with all ARARs, as required in EPA, 1991. But as recognized in EPA, 1991, it is often necessary to use best professional judgment in light of site-specific conditions. Thus, the ECBGL has the option to grant exceptions to the above purge-water handling protocol. All exceptions will be granted only after consultation with project geologists, appropriate regulatory agencies, and other appropriate professionals. Exceptions shall be granted only after the ECBGL has determined that such actions are still protective of human health and the environment.

6.2 Office Preparation

- 6.2.1 The most recent version of State or Federal MCLs or State DWALs should be consulted when determining the method of disposal of well development and well purge fluids and may be obtained from the QC Chemist.
- 6.2.2 For new wells, the FC, the Hydrogeologic Group Leader (HGL), SAL, ECBGL, and Site Safety Officer (SSO) shall exchange information such as the type and concentration of contaminants that may be encountered, quantity of purge water which may be generated, as well as the level of personal protective equipment necessary for field personnel to safely conduct any well development, aquifer testing, or well sampling.
- 6.2.3 During the development of sampling plans, and prior to the start of any routine ground water sampling activities, the SC shall review past analytical results, with the emphasis on the most recent, comparing the historical results to the most recent MCLs and DWALs, to determine what wells will require purge water to be collected, the amount of purge water which will be generated, and the types and concentrations of contaminants.
- 6.2.4 When necessary, the SC shall arrange with the FC to have the appropriate number of either 55-gal drums or portable collection tankers delivered to the desired location. New wells will automatically have collection drums or tankers supplied depending on the quantity and clarity of water. Very silty or muddy water should not be pumped into tankers. Drums are normally used except when large quantities of water, over 200 gal, are expected to be generated. A list of wells which will need tankers for purge water collection should be given to the FC prior to the start of the sampling event.
- 6.2.5 The SC shall give the FC a copy of the sampling plan which lists those wells requiring water removal from the collection vessels and treatment as described in Section 6.4.6. The details concerning treatment criteria are discussed in the following sections.

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6.3 Field Preparation

- 6.3.1 The field personnel shall place 55-gal drums or tankers for the collection of purge water immediately adjacent to the monitor well.
- 6.3.2 Attach the drums used to collect ground water to a secured pole with a cable or chain to prevent accidental spillage. Alternately, one or two drums may be secured by wrapping the cable or chain around the stove pipe of the monitor well. Three or more drums may be secured by attaching a cable or chain around the outside of all the drums without the use of a secured pole.
- 6.3.3 Label all 55-gal drums "NON-POTABLE WELL DEVELOPMENT PURGE WATER."
- 6.3.4. Label all portable tanks "NON-POTABLE WATER."
- 6.3.5. Ensure that no sediment is present in the portable tanks.
- 6.3.6. Ensure that drums are in good condition (i.e., no leaks, etc.), portable tanks are in good working order, and use water-tight lids when necessary.
- 6.3.7 Cover the top of all open 55-gal drums with chicken wire to prevent rodents and other animals from entering the drum to obtain water. This is known as the Squirrel Suicide Prevention Plan (SSPP).

6.4 Operation

Purged ground water that is suspected to contain detectable contaminant concentrations should be discharged directly to either dedicated and secured 55-gal drums or portable tanks. The proper analytical data set to use for evaluating purged ground water quality is dependent upon the type of field activity. For routine (quarterly) ground water sampling, the previous quarter's analytical data should be used. The specific analyses from an initial or nonroutine ground water sample should be used to evaluate that particular purged ground water. Composite samples should be used to evaluate ground water that is purged during well development and aquifer testing activities. For new monitor wells, the purge water should be collected in secured drums or in portable tankers until the contaminant type(s) and concentration(s) can be determined. The Purge water will continue to be collected until three consecutive analytical results demonstrate that the ground water does not contain contaminants requiring additional handling.

- 6.4.1 Disposal Criteria and Procedures for Ground Water Potentially Containing Tritium
 - A. If purged ground water contains tritium below 1,000 pCi/L, and all VOC concentrations below detection limits, then discharge purged ground water onto the ground surface in the immediate vicinity of the monitor well. Do not discharge water into any arroyo, culvert, creek, or other surface water drainage system. Discharge of purged ground water in drums to evaporate is optional.
 - B. If purged ground water contains tritium below 1,000 pCi/L, and detectable VOC concentrations are below any applicable Federal or State MCLs or DWALs, or concentrations of VOCs that do not have MCLs or DWALs are above detection limits, then pump purged ground water into drums (which have been secured to posts or bollards to prevent spillage), and allow to evaporate (air stripping is optional, Section 6.4.6). To prevent

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rainfall from potentially overfilling the drums, do not fill more than three-quarters full between September and April.

- C. If purged ground water contains tritium above 1,000 pCi/L, regardless of the presence of other contaminants, then pump purged ground water into drums, and allow to evaporate. To prevent rainfall from potentially overfilling the drums, do not fill more than three-quarters full between September and April.
- D. If purged ground water contains tritium below 1,000 pCi/L, and VOC concentrations above any applicable MCL or DWAL, regardless of concentrations of VOCs that do not have MCLs or DWALs, the SC informs the EEFSG personnel (according to the sampling plan) which wells require purged water to be collected for air stripping. The EEFSG personnel then pump purged ground water into drums, and seal drums with lids to prevent evaporation. Water is then pumped into a portable tank and air stripped according to Section 6.4.6 of this SOP. To prevent rainfall from potentially overfilling the drums, do not fill drums more than three-quarters full between September and April.

6.4.2 Disposal Criteria and Procedures for Ground Water Potentially Containing VOCs Not Containing High-Explosive (HE) Compounds, Tritium, or Free Product

- A. If purged ground water contains no detectable contaminant concentrations, then discharge purged ground water onto the ground surface in the immediate vicinity of the monitor well. Do not discharge water into any arroyo, culvert, creek, or other surface water drainage system. To discharge purge water into drums for evaporation is optional.
- B. If purged ground water contains detectable VOC concentrations below any applicable MCL or DWAL), or concentrations of VOCs that do not have MCLs or DWAL above detection limits, then discharge purged water into drums or other appropriate containers (adequately secured) to prevent accidental spillage, and allow to evaporate (air stripping is optional, Section 6.4.6). To prevent rainfall from potentially overfilling the drums, do not fill more than three-quarters full between September and April.
- C. If purged ground water contains VOC concentrations above any applicable MCL or DWAL, regardless of concentrations of VOCs that do not have MCLs or DWALs, then pump purged ground water into drums and seal drums with lids to prevent evaporation. Pump water from drums into a portable tank, and air strip according to Section 6.3.6 of this SOP.

6.4.3 Disposal Criteria and Disposal Procedures for Ground Water Potentially Containing HE Compounds

- A. If purged ground water contains HE concentrations below detection limits, and all VOC concentrations are below detection limits, then discharge purged ground water onto the ground surface in the immediate vicinity of the monitor well. Do not discharge water into any arroyo, culvert, creek, or other surface water drainage system. Discharge of purge water into drums for evaporation is optional.
- B. If purged ground water contains HE concentrations below detection limits, and detectable VOC concentrations are below values applicable MCLs or DWALs, or concentrations of VOCs do not have MCLs or DWALs above detection limits, then discharge purged water into drums or other appropriate

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containers (adequately secured) to prevent accidental spillage and allow to evaporate (air stripping is optional, Section 6.4.6). To prevent rainfall from potentially overfilling the drums, do not fill more than three-quarters full between September and April.

- C. If purged ground water contains HE concentrations above detection limits regardless of concentrations of other contaminants, then discharge purged water into drums or other appropriate containers (adequately secured) to prevent accidental spillage and allow to evaporate. To prevent rainfall from potentially overfilling the drums, do not fill more than three-quarters full between September and April.
- D. If purged ground water contains HE concentrations below detection limits, and VOC concentrations above applicable MCLs or DWALs, regardless of concentrations of VOCs that do not have MCLs or DWALs, then pump purged water into drums, and seal drums with lids to prevent evaporation. Pump water from drums into a portable tank, and air strip according to Section 6.4.6 of this SOP.

6.4.4 Disposal Criteria and Disposal Procedures for Ground Water Potentially Containing Free Product

Free product and emulsions of free product with ground water should be handled as hazardous waste and should be transported to the Livermore Site for proper disposal by the Hazardous Waste Management (HWM) Division.

6.4.5 Disposal Criteria and Disposal Procedures for Ground Water Potentially Containing Compounds Not Discussed in Sections 6.4.1 through 6.4.4.

Ground water containing contaminants not discussed earlier should be discharged into drums. Any additional disposal procedure for this water will be decided by the HGL or EC/BGL.

6.4.6 Air Stripping Procedures for VOC-Contaminated Purge Water

Air stripping procedures are performed on purge water that contain only VOCs above the MCLs. This procedure is to be used by personnel familiar with the operation of the related equipment.

- A. Transfer all purge water with VOC concentrations above the MCLs or DWALs to the 5,000-gal air-stripping tank, located in the Building 833 parking area (Attachment B). This tank is fitted with dedicated bubbling lines and recirculating pumps for optimal air-stripping capability. The air effluent from the tank is routed through activated carbon filters to trap the stripped VOCs.
- B. Record information such as the date and quantity of water to treat in the document control logbook TL-833.
- C. Allow the water to be bubbled and circulated for several days or until results indicate that the VOCs are below the minimum detectable limit, or ND. Follow the specific instructions posted at the stripping tanker for startup and operating procedures. Samples to be analyzed for VOCs are collected from an effluent sampling port every 24 hr of operation until an ND is reached. Refer to SOP 2.6, "Sampling for Volatile Organic Compounds" for sample collection procedures.

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- D. Collect an air effluent sample from the carbon canisters at least once every 24 hr of operation by attaching a Tedlar bag to the air effluent sampling port.
- E. Complete an LLNL Chain-of-Custody (CoC) form per SOP 4.2, "Sample Control and Documentation."
- F. Submit this air sample to the LLNL Environmental Chemistry Laboratory for VOC analysis on a 24-hr turnaround. If results show any breakthrough of VOCs, stop operation and replace carbon canisters.
- G. Once the results from the analyses of the purge water sample show no detected concentrations of VOCs, the water may be discharged.
- H. Open the external valves from the pumping system, and pump the water through the five high-pressure nozzles to vaporize the water into the air.
- I. Record all information in the Document Control Logbook (e.g., date, quantity of water treated, total time of air stripping, air sampling results, results of water analyses during stripping, etc.).
- J. Follow the instructions posted at the tanker for shut down of treatment tanker.

6.5 Field Post Operation

- 6.5.1 Clean out any sediment in stripping tank, portable tanks, or drums. Sample and dispose of properly, in accordance with guidance from HWM. Inspect all drums for leaks.
- 6.5.2 Inventory equipment and supplies. Replace or repair all broken or damaged equipment.

6.6 Office Post Operation

- 6.6.1 Review field logbook and forms for completeness.
- 6.6.2 Deliver original forms and logbook to the Document Control Officer.

7.0 QA RECORDS

- 7.1 Document Control Logbook
- 7.2 Chain-of-Custody Forms

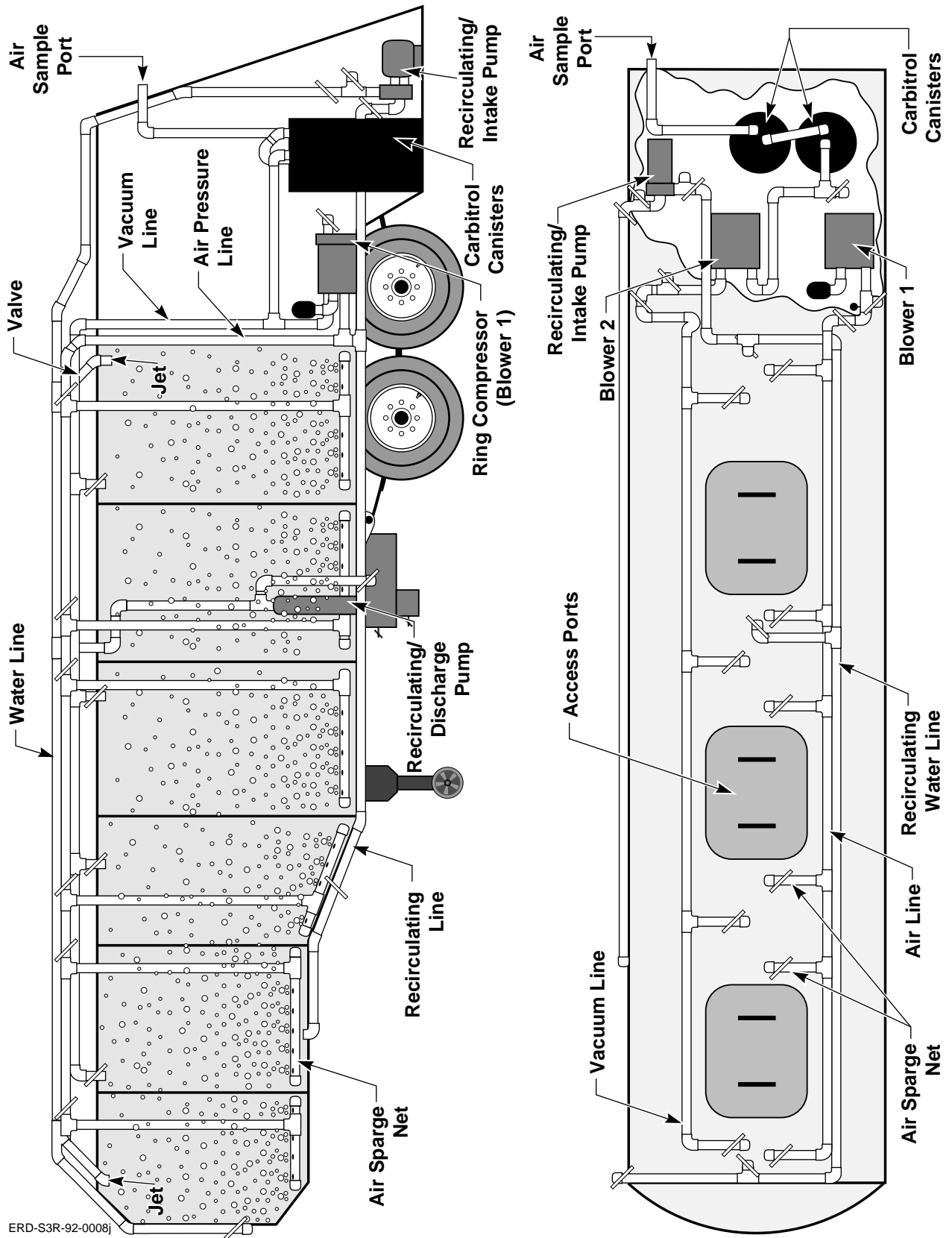
8.0 ATTACHMENTS

Attachment A—Schematic of Air Stripping Tank

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Attachment A

Schematic of Air Stripping Tank



Disposal of purge water.